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FACSIMILE TRANSMITTAL

DATE: August 6, 2003

TO: U.S. Patent & Trademark Office
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FROM: Steven M. Jensen

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Our Docket No.: 56370 (71987)

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Re: U.S. Serial Number 09/929,765

MESSAGE:

Please enter the attached Response to Office Action.

#14 Response SDamo 8/15/03

Docket No. 56370 (71987)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	C. Liao		
U.S. SERIAL NO.:	09/929,765	GROUP:	2815
FILED:	August 14, 2001	EXAMINER:	M. Warren
FOR:	BALL GRID ARRAY PACKAGE WITH ELECTRICALLY-CONDUCTIVE BRIDGE		

CERTIFICATE OF FACSIMILE TRANSMISSION

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By: _____
Steven M. Jensen

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Commissioner for Patents
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Sir:

RESPONSE TO OFFICE ACTION

Applicant is in receipt of the Office Action dated May 7, 2003 of the above-referenced application. Applicant responds to the Office Action as follows.

Applicant's claimed invention is directed to a semiconductor package having a chip mounted on a substrate, wherein the substrate includes an electrically-conductive bridge in the form of either a bonding wire (claim 6; see gold wire 90' in FIG. 6) or a chip resistor (claim 11; see chip resistor 90" in FIG. 7) for electrically connecting a corresponding via and bond finger, which are not otherwise directly connectable due to the presence of an interposing electrically-conductive trace (e.g., trace 70A in FIGS. 6 and 7). The electrically-conductive bridge spans in an overhead manner across the interposing trace, such that a gap (which is unfilled) is formed between the electrically-conductive bridge and the interposing trace.

The above-described electrically-conductive bridge can be implemented in an easy and cost-effective manner by utilizing existing wire-bonding technology or surface-mount technology (SMT), which allows via/bond finger bridging to be implemented on a single-layer substrate, without having to use a multi-layer substrate to provide electrical connectivity. Applicant has solved the problem of connecting overlapping electrically-conductive traces by using a single-layer substrate, thereby reducing manufacturing complexity and fabrication costs as compared to prior art solutions which require a multi-layer substrate.

Claims 6-8 and 11-13 were rejected under 35 USC 103(a) as being unpatentable over "Applicant's Prior Art Figures 3 and 4 (APAF)" in view of U.S. Patent 3,560,256 to Abrams. This rejection is respectfully traversed.

With reference to the Background section of the specification, prior art FIG. 3 shows an example in which bond finger 60B cannot be directly connected to via 80A using a continuous electrically-conductive trace (see page 3, lines 2-3); if such a direct connection were attempted, the interposing trace 70A would be impacted. Prior art FIG. 4 provides a solution to the problem of FIG. 3 by incorporating a multi-layer substrate; however, as discussed in the Applicant's specification, the use of a multi-layer substrate is undesirable due to its high cost and complexity (see page 3, lines 10-15).

Abrams fails to teach or suggest a BGA package including an electrically-conductive bridge with a gap formed between the bridge and an interposing trace.

With reference to FIG. 1 of Abrams, a thick-film crossover conductor 26 is formed on a substrate 21 to connect a pair of conductors 22a, 22b, and spaced apart from conductors 22c, 22d by a thick-film crossover dielectric 27 (see column 3, lines 72-75). The crossover dielectric 27 is preferably composed of glazes having the following properties: low dielectric constant, high dielectric strength, low leakage and low dissipation factor, to minimize capacitive coupling between crossing paths (see column 4, lines 64-70).

Abrams does not teach or suggest a gap (i.e., an unfilled space) formed between a bridge (bonding wire or chip resistor) and the interposing trace. Therefore, in the Applicant's invention, the gap would not impede resin flow during an encapsulation process for encapsulating the substrate and chip with a resin, thereby avoiding the formation of voids and popcorn effect.

On the contrary, in Abrams, the dielectric 27 is interposed between the crossover conductor 26 and the conductors 22c, 22d, which can undesirably impede or unbalance a resin flow when the substrate 20 is subject to an encapsulation process. This can lead to significant problems in fabricating the package structure of Abrams, including the formation of voids and popcorn effect. Moreover, under a subsequent thermal cycle, delamination can occur between the dielectric 27 and the resin, since adhesion would be weakened due to the uneven resin coverage. The thermal stresses generated between the dielectric 27 and the resin can also affect the crossover conductor 26, and produce cracks in the crossover conductor 26. Further, use of the dielectric 27 in Abrams would lead to higher fabrication costs. The Applicant's claimed invention avoids such drawbacks by providing an unfilled gap between the electrically-conductive bridge and the interposing trace, where the package can be fabricated by using conventional wire-bonding or surface-mount technology.

On page 4 of the Office Action, it was stated that "the gap includes a space between bridge and trace but does not necessarily mean that the space includes air." It is respectfully submitted that the Examiner is prescribing a meaning to the term "gap" which is different from its ordinary meaning and/or how it would be interpreted by one of ordinary skill in the art.

The ordinary meaning of "gap" implies an absence of any solid material, i.e., an empty space filled only by air. For example, Webster's Collegiate Dictionary (10th Edition, 1997) defines a "gap" as: "a separation in space". Moreover, one of ordinary skill in the art, provided with the Applicant's claims, would have sufficient teaching to produce an electrically-conductive bridge with a "gap" (or unfilled space) between the bridge and interposing trace. As explained above, by filling a material in this space, there is no longer any "gap." Moreover, use of the dielectric 27 in Abrams could lead to problems such as the formation of voids, popcorn effect, unbalanced resin deposits, and delamination.

It is believed the application is in condition for immediate allowance, which action is earnestly solicited.

Respectfully submitted,

Date: August 6, 2003

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